

# LEAD ZIRCONATE TITANATES

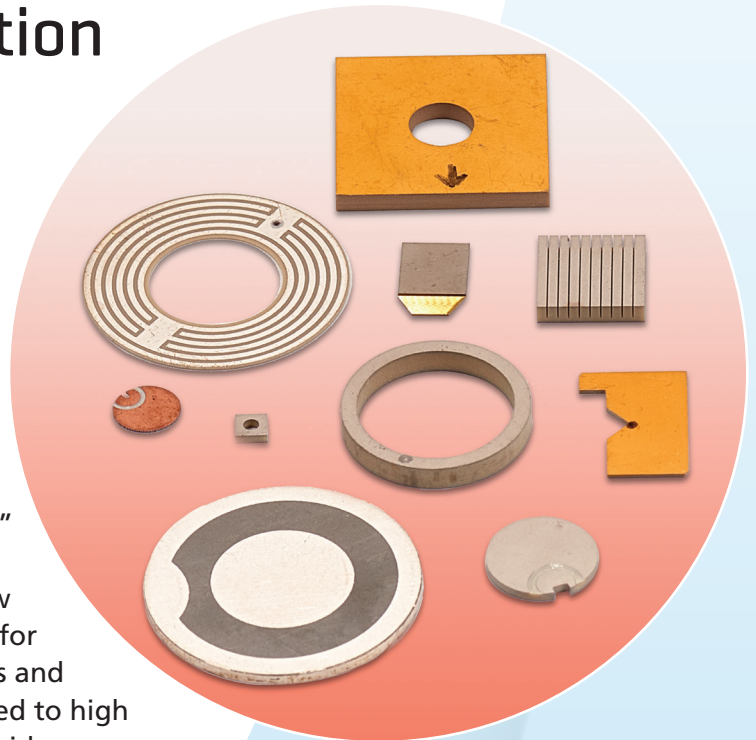
## Performance, Quality and Service for Every Application

- Wide Variety of Material Types
- 100% Inspection
- Precision Tolerances
- Unique Configurations

For superior performance in your ultrasonic devices, select EBL lead zirconate titanate piezoceramics.

EBL offers an extensive range of both “hard” and “soft” lead zirconate titanate compositions. Hard materials exhibit low dielectric losses, high mechanical Q, and low dielectric constants. These materials are recommended for ultrasound therapy assemblies, cleaner, sonar projectors and related applications in which the piezoceramic is exposed to high drive fields and/or mechanical stress. Soft materials provide high coupling coefficients and low mechanical Q for micropositioners, NDT and medical imaging transducers, hydrophones and similar high sensitivity devices. Additionally, we will fabricate from any manufacturer’s piezoceramic that you specify.

EBL’s lead zirconate titanates are available with fired-on or electroless electrodes. Fired-on electrodes are applied to the surface of the piezoceramic by screen-printing or airbrushing, and then fused onto the ceramic at high temperature. Electroless electrodes are applied by an aqueous immersion process developed by EBL.



# LEAD ZIRCONATE TITANATES CHARACTERISTICS

MATERIAL PROPERTIES	EBL #1	EBL #2	EBL #3	EBL #4	EBL #6	EBL #9	EBL #23	EBL #25
Density g/cm <sup>3</sup>	7.5	7.5	7.45	7.5	7.45	7.6	7.8	7.7
Dielectric constant K <sub>T</sub>	1300	1725	3450	1050	2750	1450	3800	1800
Mechanical Q	400	100	65	960	75	600	30	80
Dissipation % @ 1KHz	0.4	2.0	2.0	0.4	2.0	0.4	2.4	1.8
Curie Temperature °C	320	350	190	300	220	320	250	350
<b>d constant m/Vx10<sup>-12</sup></b>								
d <sub>33</sub>	295	380	583	220	480	315	650	350
d <sub>31</sub>	-127	-173	-262	-95	-260	-135	-320	-179
d <sub>15</sub>	506	584	730	330	670	-	-	-
<b>g constant Vm/Nx10<sup>-3</sup></b>								
g <sub>33</sub>	25.0	25.0	19.1	24.5	20.9	24.6	19.0	24.2
g <sub>31</sub>	-10.7	-11.5	-8.6	-10.5	-9.8	-10.5	-9.0	-11.0
g <sub>15</sub>	39.8	38.2	28.9	28.9	35.0	-	-	-
<b>Coupling coefficients</b>								
k <sub>p</sub>	0.60	0.62	0.64	0.52	0.63	0.60	0.75	0.63
k <sub>33</sub>	0.69	0.72	0.75	0.62	0.74	0.71	0.75	0.70
k <sub>31</sub>	0.36	0.36	0.38	0.31	0.37	0.34	0.44	0.30
k <sub>15</sub>	0.72	0.69	0.68	0.55	0.67	-	0.68	-
<b>Frequency constants Hzm</b>								
Thickness	2026	1778	1765	2181	1727	1990	2030	2050
Planar	2149	1994	1981	2311	1943	2110	-	2020
Transverse	1321	1092	1105	1415	1058	-	-	-
<b>Industry Types</b>								
	PZT-4	PZT-5A	PZT-5H	PZT-8	PZT-5J	PZT-4D	-	-
	EC-64	EC-65	EC-76	EC-69	EC-70	-	-	-
<b>Navy Type</b>								
	I	II	VI	III	V			II

## Polarization:

thickness, shear, radial or mixed modes; (+) polarity indicated.

## Geometries:

disc, rectangle, rod, washer, tube, D-shape, spherical focus, cylindrical focus, plano-concave, axicon, truncated cone.

## Dimensions available:

Size: 0.06" min., 6" max.  
 Thickness mode frequency: 200 KHz to 20 MHz  
 Shear mode frequency: 250 KHz to 7.5 MHz  
 Cylindrical radii: 1.0", 1.5", 2.0", 2.5", 3.0", 3.94" standard  
 Spherical radii: 0 to 33 diopter standard

## Standard tolerances:

Disc diameter: +0/-0.003"  
 Tube or washer diameter: +/-0.002"  
 Length and width: +/-0.005", except +/-0.003" for tubes or washers

## Thickness mode frequency:

+/-5% to MHz  
 +/-10% above 10 MHz

## Thickness uniformity:

+/-0.0003" up to 3.5" max dimension (flat parts)  
 +/-0.0008" above 3.5" max dimension (flat parts)  
 +/-0.001" for tubes or washers  
 +/-0.0005" for spherical or cylindrical radius

## Spherical radius:

0 - 9.9 diopter: +/-0.25 diopter  
 10-19.9 diopter: +/-0.5 diopter  
 20 - up diopter: +/-0.75 diopter

## Electrodes:

Types: fired silver, electroless nickel, copper, or gold  
 Thickness: 0.0005" typical per side for fired electrodes  
 0.0002" typical per side for electroless nickel  
 <100μ is typical per side for electroless copper or gold

## Geometries:

: 35μ in rms typical for fired electrodes  
 : 32μ in rms typical for electroless nickel  
 : 8μ in rms typical for electrodes copper or gold

## Options:

: wrap around electrodes or other special electrode patterns  
 : 3% frequency tolerance  
 : steep radius  
 : lead wire attachment

Other dimensions, tolerances, electrodes, and options available upon request. Drawings or sketches are required.  
 Dimensions above are for reference only and may not be available for all material compositions and geometries. All appropriate dimensions are inclusive of plating thickness.

## WARNING:

These products may contain up to 80% lead. Do not breathe or ingest dust. Exposure may cause serious adverse health effects. Dispose of in accordance with federal, state and local environmental laws.  
 These products may develop a strong electric charge. Ground to avoid risk of electric shock.